

Remarks

In the above Listing of Claims, Claims 1, 7, 8, 11, 30, 45, 46 and 48 have been amended, and new Claim 58 has been added. Claims 55 – 57 were canceled in the Preliminary Amendment filed with the application documents. No new matter has been added. All of the claim amendments and new Claim 58 are clearly supported by the original disclosure. Applicants will be happy to identify the specific support for any of the amended or new claims upon request by the Examiner.

The principal claim amendment is to independent Claim 1, which has herein been amended to recite that the “first reactant” is fed “onto a substrate together with a first catalyst” (emphasis added) and that the “second reactant” is fed “onto the chemisorbed layer together with a second catalyst” (emphasis added). Similar recitations appear in original Claim 21 and original Claim 34. As discussed below, these amendments to Claim 1 are believed to overcome both the “obviousness”-type double patenting rejection and the Sec. 102 rejection of the December 23, 2005 Office Action.

A. The Double Patenting Rejection

Claims 1 – 54 were provisionally rejected on the ground of nonstatutory obviousness-type double patenting over claims 1 – 43 of U.S. Application Serial No. 10/459,943, the parent of the present CIP application, in view of the Werkhoven et al. patent (Werkhoven ‘395).

Applicants call the Examiner’s attention to the fact that U.S. Application Serial No. 10/459,943 has been allowed with Claims 1 – 36, the Issue Fee has been paid, and the patent

may issue at any time. Also, Applicants call the Examiner's attention to a Divisional application, U.S. Application Serial No. 11/255,999, based on Serial No. 10/459,943, filed on September 14, 2005.

Applicants respectfully request that the double patenting rejection be reconsidered and withdrawn in view of the following remarks. Applicants believe that a careful reading of the present application, and a detailed comparison of the claims of this application with the claims of U.S. Ser. No. 10/459,943 and the disclosure of Werkhoven '395, clearly shows that there is not enough overlapping claimed subject matter between the present claims and those of the copending application to support an "obviousness"-type double patenting rejection.

Claim 1 of the present application as herein amended claims a "method for forming a silicon dioxide film on the surface of a substrate using a catalyst-assisted atomic layer deposition process...." Claim 1 further recites a "method comprising the sequential steps of: (a) feeding a halogen- or NCO-substituted siloxane as a first reactant onto a substrate together with a first catalyst to form a chemisorbed layer comprising the first reactant; and (b) feeding a second reactant onto the chemisorbed layer together with a second catalyst to form the silicon dioxide film on the substrate."

The Examiner has argued that the "Copending Application No. 10/459,943 discloses substantially the claimed method for forming a silicon dioxide by ALD except the use of a halogen or NCO-substituted siloxane as a silicon source...." This argument is incorrect in several respects. First, for purposes of a "double patenting" rejection, it is only the claims, not the entire disclosure, of the copending application that is relevant. Second, although the present application and the copending application have in common the use of an ALD-type of process to

deposit a silicon dioxide layer on a substrate, the two inventions employ completely different chemical reagents.

More particularly, the allowed claims of copending application Ser. No. 10/459,943 claim a method that includes “supplying a first reactant... wherein said first reactant is a silicon-halide compound having at least two silicon atoms....” (emphasis added). Allowed Claim 4 of Ser. No. 10/459,943 specifically provides that the first reactant be “selected from the group consisting of Si_2X_6 , Si_3X_8 , Si_4X_{10} and Si_3X_6 (Triangle), wherein X is a halogen.” The Specification of Ser. No. 10/459,943 explains in detail the importance of using as a first reactant a silicon-halide compound, such as Si_2Cl_6 , having at least two silicon atoms. The Specification also provides both scientific theory and specific examples to support the criticality of using as a first reactant a silicon-halide compound having at least two silicon atoms.

By contrast, the methods of Claims 1 – 54 of the present invention do not recite, nor are they broad enough to encompass, silicon-halide compounds having at least two silicon atoms as defined in Ser. No. 10/459,943. Instead, the claims of the present invention use “a halogen- or NCO-substituted siloxane as a first reactant....” Whereas a silicon-halide compound does not include an oxygen molecule, a siloxane compound does include an oxygen molecule.

The Examiner acknowledged this important distinction, but he also argued (page 2 of the Office Action of December 23, 2005) that this admitted difference between the claims of the two applications is merely an “obvious” difference based on the teachings of the Werkhoven ‘395 patent. Specifically, the Examiner stated that “Werkhoven et al., in a related method for forming a thin film by atomic layer deposition, col. 9, lines 49-59, teaches the use of a halogen or NCO-

substituted siloxane as a silicon source for forming a layer of silicon dioxide.” Applicants respectfully disagree with this characterization of the teachings of the Werkhoven ‘395 patent.

First, Werkhoven ‘395 does not teach a “related method for forming a thin film” because Werkhoven ‘395 does not teach either a “method for forming a silicon dioxide film on the surface of a substrate” or a “catalyst-assisted atomic layer deposition process,” both as claimed in the present application.

With regard to the difference in the chemical compositions of the deposited films, the present application and its claims are clearly directed to depositing “silicon dioxide” films. By contrast, Werkhoven ‘395 is directed to depositing silicon nitride films or hybrid (or graded) films of both silicon dioxide and silicon nitride (see, e.g., Werkhoven ‘395 at col. 2, lines 7-22; col. 3, lines 15-17; col. 3, lines 22-26; col. 3, lines 33-37; and col. 4, lines 2-6). Indeed, even the portion of Werkhoven ‘395 referenced by the Examiner in the December 23, 2005 Office Action (col. 9, lines 35-65) refers to silicon compounds “used for the deposition of pure silicon nitride....” (emphasis added).

With regard to the catalyst-assisted difference, the Examiner implicitly acknowledged this important difference in the December 23, 2005 Office Action by rejecting (as being anticipated by Werkhoven ‘395) those claims (i.e., Claims 1 – 6, 9 – 12 and 18 – 20) that failed to expressly recite supplying a catalyst together with the first and/or second reactants, while not rejecting those claims (i.e., Claims 7 – 8 and 21 – 54) that did expressly recite supplying a catalyst.

Claim 1 as amended herein now expressly recites that the first reactant is fed “together with a first catalyst” and the second reactant is fed “together with a second catalyst”. All of

pending Claims 1 – 54 and new Claim 58 now directly or by way of claim dependency include this provision for catalyst-assisted atomic layer deposition.

Although copending application Serial No. 10/459,943 is also directed to catalyst-assisted ALD, Serial No. 10/459,943 only suggests the utility of catalyst-assisted ALD in connection with a very specific category of first reactant materials, namely with “silicon-halide compounds having at least two silicon atoms.” Nothing in Werkhoven ‘395 teaches or suggests that a catalyst-assisted ALD process as claimed in Serial No. 10/459,943 could also be utilized with a completely chemically different first reactant, namely with a siloxane compound, nor does Werkhoven ‘395 teach or suggest anything about what the proper first catalyst would be for use with a siloxane compound, nor does Werkhoven ‘395 teach or suggest anything about what the proper second reactant/second catalyst combination would be for catalyst-assisted ALD using a siloxane compound. Accordingly, the claims of the present application are not an “obvious” variation of the claims in Serial No. 10/459,943, even taken together with Werkhoven ‘395.

Furthermore, Applicants also draw the Examiner’s attention to col. 9, lines 60-62 of the Werkhoven ‘395 patent. Although the Examiner referenced col. 9, lines 35-59 of Werkhoven ‘395 as teaching “the use of a halogen or NCO substituted siloxane as the first reactant....,” the Examiner seemingly ignored the teaching immediately following, namely: “Of these silicon compounds, preferably silanes and silazanes are used for the deposition of pure silicon nitride because siloxanes have a rather strong Si-O bond,” (emphasis added). Thus, if anything, Werkhoven ‘395 appears to teach away from the substitution of siloxanes in place of silicon halides as the first reactant for an ALD process. In addition, the teaching of Werkhoven ‘395 that “siloxanes have a rather strong Si-O bond” reinforces the argument made above that,

because different chemical compounds react differently, Serial No. 10/459,943 and Werkhoven '395 taken together teach nothing about the proper choice of a first catalyst for use with a siloxane compound in a catalyst-assisted ALD process nor about the proper second reactant/second catalyst combination. For these reasons as well, the claims of the present application are not an "obvious" variation of the claims in Serial No. 10/459,943.

Therefore, the Examiner's "obviousness"-type double patenting rejection should be reconsidered and withdrawn.

B. The Sec. 102 Rejection

Claims 1 – 6, 9 – 12 and 18 – 20 were rejected under 35 U.S.C. Sec. 102(e) as being anticipated by the Werkhoven '395 patent. Applicants respectfully request that this ground of rejection be reconsidered and withdrawn in view of the amendments herein to Claim 1 and in view of the Remarks in part (A) above distinguishing the claims of this application from the teachings of Werkhoven '395.

In particular, as discussed above, Werkhoven '395 does not teach catalyst-assisted ALD; Werkhoven '395 teaches away from using a siloxane compound as the first reactant in an ALD process; and Werkhoven '395 does not teach the proper selection of first catalyst or of the second reactant/second catalyst combination for a catalyst-assisted ALD process using a siloxane compound as the first reactant.

Accordingly, reconsideration of this ground of rejection and the allowance of pending claims 1 – 54 and 58 is respectfully requested.

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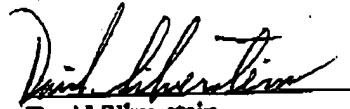
Attorney Docket No.: SAM-0483
Application Serial No. 10/782,094
Reply to Office Action of: December 23, 2005

Closing Remarks

It is submitted that all of the pending claims are now in condition for allowance, and such allowance is respectfully requested. If prosecution of the application can be expedited by a telephone conference, the Examiner is invited to call the undersigned at the number given below.

Respectfully submitted,

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